crystallize on a slip of glass, and crystals small enough to be transparent were examined by daylight with an $\frac{1}{8}$-inch objective; no remarkable difference was observed in the colour of different crystals of the same thickness, and the polariscope did not show them to be pleochroïc, the two contrasting colours, violet and red, being due to different thicknesses of crystals. To aid me in the above experiments, Messrs. Howards and Sons, of Stratford, very generously supplied me with the sulphates of cinchonidine and quinidine in a pure state; and I beg to offer them my best thanks for the kindness. The iodine compound of the tetrethylammonium occurs in prismatic crystals resembling the sulphate of iodoquinidine, but exhibits no property of interest.

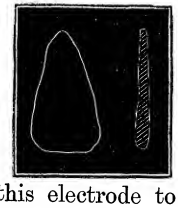
II. "On the Quantitative Analysis of certain Alloys by means of the Spectroscope." By J. Norman Lockyer, F.R.S., and William Chandler Roberts, Chemist of the Mint. Received November 20, 1873.

(Abstract.)

The authors, after referring to experiments which showed clearly that the spectroscope might be employed to detect minute differences in the composition of certain alloys, proceed to give an account of the researches which they had instituted with a view to ascertain the degree of accuracy of which the method is capable.

The image of an electric spark passing between the unknown alloy and a fixed electrode being thrown by means of a lens on the slit of the spectroscope, the phenomena observed were found to vary with the composition of the alloys; and further, by arranging them together with known check-pieces on a suitable stand, and bringing them in turn under the fixed electrode, the composition of the unknown alloys was determined by comparison with the known check-pieces.

The shape of the electrode ultimately adopted was that represented in the sketch; and these pieces were held in their places by suitable metallic clips. Special attention was then directed to the adjustment of the length of the spark, which was found to materially influence the phenomena. The method adopted consisted in placing the variable electrode in the field of a fixed microscope having a 3- or 4-inch objective, and adjusting the summit of this electrode to coincide with the spider-lines of the eyepiece.



After a series of experiments on alloys of zinc and cadmium of various compositions, the results of which were shown on a curve, more extended trials were made with the gold-copper alloy employed in coinage, which was peculiarly suited to these researches in consequence of the known method of assay having been brought to so high a state of perfection (the composition being determined with accuracy to the $\frac{1}{10,000}$ part of the original assay-piece of about 7 grains), and from the fact that reliance can be

placed on its homogeneity. The paper is accompanied by a series of four curves, which show the results of experiments, and in which the coördinates are given by the ordinary method of assay, and by the spectroscopic readings.

The chief practical advantage which appeared to flow from this inquiry was that, if it were possible to replace the parting assay by the spectroscopical method, a great saving of time in ascertaining the value of gold bullion would be effected.

III. "Researches in Spectrum-Analysis in connexion with the Spectrum of the Sun."—Part III. By J. Norman Lockyer. Received November 20, 1873.

(Abstract.)

The paper commences with an introduction, in which the general line of work since the last paper is indicated. Roughly speaking, this has been to ascertain the capabilities of the new method in a quantitative direction. It is stated that while qualitative spectrum-analysis depends upon the *positions* of the lines, quantitative spectrum-analysis on the other hand depends not on position but on the *length*, *brightness*, and *thickness* of the lines.

The necessity of maps carefully executed and showing the individuality of each line is shown; and it is stated that the execution of these maps required the use of the electric arc to render the vapours of the metals incandescent. A battery of 30 Grove's cells of one pint capacity was accordingly employed in the researches about to be described.

The difficulties of eye-observations of the characters of the lines compelled the application of photography, another reason for the use of which existed in the facility it afforded for confronting spectra with each other, and so eliminating coincident lines, since the lines, if due to impurities, would be longest and thickest in the spectrum to which they really belonged.

The portion of the spectrum at present worked upon is that from H to F.

Another branch of the research has been the construction of a Table of all the named Fraunhofer lines, showing the lengths and thicknesses of the metallic lines to the absorption of which they were due; this Table enabled the author to allocate upwards of 50 lines in the solar spectrum, presumably overlooked by Ångström and Thalén. The Table was intended as a preliminary to a new photographic map of the spectrum from H to F, on a larger scale than Ångström's, which was intended to clear away all the difficulties touching coincidences—and to have below it complete maps of all the solar elements with their long and short lines. This map is incomplete at present, but is making rapid progress.